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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Hyeng-Rae SEON *et al.*

Serial No.:	10/759,098	Examiner:	*to be assigned*
Filed:	20 January 2004	Art Unit:	*to be assigned*

For: FIELD EMISSION DISPLAY AND METHOD OF MANUFACTURING THE SAME

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O.Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with 37 C.F.R. §1.56, and §§1.97 and 1.98(a)(2) as amended, Applicant cites, describes, and provides copies of the following art references. However, copies of U.S. Patent reference(s) are not provided under 37 C.F.R. §1.98(d)(2).

U.S. PATENT REFERENCES:

- U.S. Patent No. 6,580,211 B1 to Yang *et al.*, entitled *TRIODE ASSEMBLY FOR CARBON COLD CATHODE*, issued on 17 June 2003;
- U.S. Patent No. 6,377,002 B1 to Ge et al., entitled *COLD CATHOD FIELD EMITTER FLAT SCREEN DISPLAY,* issued on 23 April 2002;
- U.S. Patent No. 6,765,346 B1 to Lee *et al.*, entitled *FIELD EMISSION DISPLAY HAVING FIELD EMITTERS IN A ZIGZAG PATTERN,* issued on 2 October 2003;

- U.S. Patent Publication No. 2003042841 A1to Ku *et al.*, entitled *VACUUM FLUORESCENT DISPLAY WITH RIB GRID*, published on 4 July 2002; and
- U.S. Patent Publication No. 2002024296 A1 to Uemura *et al.*, entitled VACUUM FLUORESCENT DISPLAY, published on 28 February 2002.

FOREIGN PATENT REFERENCES:

- Korean Patent Publication No. 1020020011617 to Choi *et al.*, entitled *MIC(METAL-INSULATOR-CARBON) TYPE FIELD EMISSION DEVICE USING CARBON NANOTUBES AND INSULATOR*, published on 9 February 2002 ;
- Korean Patent Publication No. 1020010081496 A to Choi *et al.*, entitled *FIELD EMISSION DEVICE ADOPTING METAL MESHING GRID AND METHOD FOR FABRICATING THEREOF AND FOCUSING METHOD OF EMISSION ELECTRON*, published on 29 August 2001;
- Korean Patent Publication No. 1020030077852 A to Lee *et al.*, entitled *FIELD EMISSION DISPLAY*, published on 4 October 2003;
- European Patent Application No. 1146541 A2 and A3 to Han *et al.*, entitled *TRIODE CARBON NANOTUBE FIELD EMISSION DISPLAY AND MANUFACTURING METHOD THEREOF*, published on 17 October 2001; and
- European Patent Application No. 0854493 A1 to Beeteson *et al.*, entitled *CATHODE FOR DISPLAY DEVICE*, published on 22 July 1998.

OTHER DOCUMENTS:

- *European Office Action* issued by the European Patent Office in applicant's corresponding European Patent Application No. EP 04250272, issued on 22 August 2005;
- Database WPI Section EI, Week 200265, XP002338968, published on 9 February 2002 (same as KR 1020020011617 to Choi *et al.*);

- Database WPI Section EI, Week 200240, XP002338969, published on 29 August 2001 (same as KR 1020010081496 A to Choi *et al.*) ;

- Journal of Vacuum Science and Technology: Part B, vol. 18, no. 2, entitled *INTEGRATION OF HIGH VOLTAGE FIELD EMISSION DISPLAY FOLLOWED BY MACRO- AND NANOSTRUCTURAL ANALYSIS ON MICROTIP,* XP001189083, published on March 2000; and

- Database WPI Section EI, Week 200410, XP002338970, published on 20 July 2004.

DISCUSSION

As written in the Office Action on 22 August 2005 in applicant's corresponding European Patent Application No. EP 04250272 corresponding to applicant's above-captioned U.S. Patent Application, **Choi *et al.* 'KR 617 A** and **WPI Section EI 'XO 968** discusses that a MIC(Metal-insulator-Carbon) type field emission device using carbon nanotubes and insulators is provided, which can control an emission current easily by locating a gate electrode below a cathode. A mesh-grid(180) is inserted between a cathode(121) and an anode(140) to control the spreading of emission electrons due to an edge emission, and thus a color separation can be improved. The mesh-grid can prevent an electric field of the anode from influencing on the cathode when a high voltage is applied to the anode to obtain a high brightness. According to the fabrication sequence of an under-gate structure, a gate is formed on a substrate and an insulation layer is placed on the gate, and then the cathode is formed on the insulation layer. After coating a mixed material of a carbon nanotube and a dielectric material along the cathodes or on a dot region where the cathodes are overlapped with the gates, a front substrate(200) and a rear substrate (11) are sealed in vacuum using a spacer(160).

Choi 'KR 496 A and WPI Section EI 'XO 969 discusses that a field emission device

adopting metal meshing grid and method for fabricating thereof and focusing method fo emission electron are provided to improve display color purity although using high spacer by varying a voltage inputted to a metal mesh grid. A field emission device comprises a transparent front substrate(15) and the back substrate(11), and maintain regular interval. On the back substrate(11) sequentially comprises cathodes(12) on a stripe, an insulated layer(13), and gates(14) on the stripe across the cathode(12). The insulated layer(13) on the cathode(12) forms holes(13). A micro tip(12) is comprised on the cathode exposed by the holes(13). The gates(14) comprise an opening corresponding to the holes(13). On the opposite face of the inter side of the front substrate(15) is formed with anodes(16) on the stripe across the cathode(12). On the anodes(16) comprises a phosphor. A metal mesh grid(19) controls electrons emitted from the micro tip(12) between the gate and the anode.

Journal of Vacuum Science and Technology 'XO 083 discusses that for resolving electron beam focusing and electric field breakdown between the anode and cathode plates in a high voltage field emission display (FED), the metal mesh grids are adapted in one body with spacers. The spacer charging mechanism is modeled in the real panel domain and confirmed by experiment. We analyze the morphology and the chemical composition modifications of the microtips in the narrow vacuum gap of a 5.2 in. FED panel, and infer possible degradation mechanisms in a FED device from our experimental data. The degree of oxidation formed on the microtip surface during fabrication and device operation is studied. Gas aging method for suppressing oxidation of the microtips and stabilizing phosphor is implemented for our 5.2 in. high voltage FED.

Database WPI Section EI 'XO 970 discloses that the field emitters (12) are formed along X-axis and Y-axis directions on cathode (10) at the areas corresponding to each pixel region provided between gate electrodes (6) and cathode such that the field emitters are arranged in zig zag patterns. The electrons emitted from field emitters are accurately transmitted to the phosphor layers formed on the anode by arranging field emitters in zigzag pattern.

Lee *et al.* 'KR 852 A discusses that a field emission display is provided to achieve improved color purity of display and luminance of screen by increasing the effective filing ratio of electron beam with respect to the phosphor screen. A front substrate(2) and a rear substrate(4) are opposed to each other. A plurality of gate electrodes(6) are arranged into a line pattern along a first direction on the rear substrate opposed to the front substrate. An insulating layer(8) is formed on the rear substrate in such a manner that the insulating layer covers the gate electrodes. A plurality of cathode electrodes(10) are arranged on the insulating layer into a line pattern along a second direction perpendicular to the first direction. An emitter(12) serves as a plane electron source disposed on the edge of the cathode electrode with respect to the pixel area where the gate electrode and the cathode electrode cross with each other. An anode electrode(20) is arranged on the front substrate opposed to the rear substrate. A phosphor screen(22) is formed on the surface of the anode electrode.

Han *et al.* 'EP 541 A2 and A3 discusses that a triode carbon nanotube field emission display (FED) using a barrier rib structure and a manufacturing method thereof are provided. In a triode carbon nanotube FED employing barrier ribs, barrier ribs (130) are formed on cathode lines (120) by a screen printing method, a mesh structure (190) is mounted on the barrier ribs, and a spacer(180) is inserted between the barrier ribs through slots of the mesh structure, thereby stably fixing the mesh structure and the spacer within a FED panel due to support by the barrier ribs.

Beeteson *et al.* 'EP 493 A1 discusses that a display device comprises field emission cathode means for emitting electrons. A plurality of electron beams are formed from the field emission cathode means. A screen, which has a phosphor coating facing the cathode receives the plurality of electron beams. The phosphor coating comprises a plurality of pixels each corresponding to a different one of said plurality of electron beams. A grid electrode means is disposed between the cathode means and the screen for controlling the flow of electrons from the cathode means. The field emission cathode means comprises extractor grid means, having

a plurality of separately addressable portions associated with each of said plurality of pixels. A gamma transfer function between input data value and beam current is provided in order to emulate a conventional CRT. This can be achieved by use of a lookup table.

Yang *et al.* '211 discusses that a triode structure code cathode assembly is produced by depositing a carbon emitter material onto a substrate to form a cathode structure. Then, an insulating layer is deposited onto one side of a mesh foil to form a mesh assembly. This mesh assembly is then mechanically attached to the cathode structure so that the insulating layer on the one side of the mesh assembly is contacting the cathode structure. This entire triode cathode assembly can then be used to produce a field emission display device by including an anode structure.

Ge *et al.* '002 discusses that strips of field emitters arranged in rows overlap grid electrodes when viewed in the viewing direction to define pixel dots. Scanning electrical voltages are applied to the rows of field emitters to perform scanning and data potentials are applied to the grid electrodes to control the brightness of the display. Potentials applied to the grid electrodes also focus the electrons from the field emitters. A metal mesh with grid electrodes fabricated thereon to form an integrated structure greatly simplifies the manufacture of the display.

Lee *et al.* '346 discusses that a field emission display includes a front substrate and a rear substrate provided opposing one another with a predetermined gap there between; gate electrodes formed in a line pattern in a first direction and cathode electrodes formed in a line pattern in a second direction, which is perpendicular to the first direction, on a surface of the rear substrate opposing the front substrate; an insulating layer formed between the gate electrodes and the cathode electrodes; and a plurality of field emitters formed on the cathode electrodes at areas corresponding to each pixel region where the gate electrodes intersect the cathode electrodes. Any one of the field emitters adjacent in one of the first and second

directions to another field emitter is at a predetermined distance from the another field emitter in the other of the first and second directions.

Ku ***et al.*** **'841** discusses that vacuum fluorescent display includes a vacuum tube with a pair of substrates, and a side glass disposed between the two substrates. Filaments are mounted within the vacuum tube to emit thermal electrons. A conductive layer is formed at one of the substrates with a predetermined pattern, and a phosphor layer is formed on the conductive layer. A rib grid is provided at the substrate with an insulating rib positioned around the conductive layer, and a control electrode is formed on the top surface of the insulating rib. Assuming that the distance between the top surface of the substrate and the top surface of the insulating rib is indicated by h1, and the distance between the top surface of the substrate and the top surface of the phosphor layer is indicated by h2, it is established that h1.ltoreq.h2.

Umura ***et al.*** **'296** discusses that a vacuum fluorescent display includes a front glass member, substrate, control electrode, plate-like field emission type electron-emitting source, mesh-like electron extracting electrode, and phosphor film. The front glass member has light transmission properties at least partly, and the substrate opposes the front glass member through a vacuum space. The control electrode is formed on an inner surface of the substrate. The plate-like field emission type electron-emitting source with a plurality of through holes is arranged in the vacuum space to be spaced apart from the control electrode. The mesh-like electron extracting electrode is formed between the field emission type electron-emitting source and the front glass member to be spaced apart from the field emission type electron-emitting source. The phosphor film is formed inside the front glass member.

Pursuant to 37 CFR § 1.97 (e)(1), that each item of information contained in the Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign patent application not more than (3) three months prior to the filing of the Information Disclosure Statement.

The citation of the foregoing references is not intended to constitute an assertion that other or more relevant art does not exist. Accordingly, the Examiner is requested to make a wide-ranging and thorough search of the relevant art.

No fee is incurred by this Statement.

Respectfully submitted,

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INFORMATION DISCLOSURE STATEMENT PTO-1449 (PAGE 1 OF 1)	SERIAL NUMBER	10/759,098	DOCKET NO.	P57021
	APPLICANT	Hyeng-Rae SEON *et al.*		
	FILING DATE	20 January 2004	GROUP	*to be assigned*

U.S. PATENT DOCUMENTS

EXAMINER INITIALS	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	6,580,211 B1	06/03	Yang et al.			
	6,377,002 B1	04/02	Ge et al.			
	6,765,346	10/03	Lee et al.			
	2003042841 A	07/02	Ku et al.			
	2002024296 A1	02/02	Uemura et al.			

FOREIGN PATENT DOCUMENTS

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	1020020011617	02/02	Korea			Abstract	
	1020010081496 A	08/01	Korea			Abstract	
	1020030077852	10/03	Korea			Abstract	
	1146541 A2	10/01	Europe				
	0854493 A1	07/98	Europe				

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)

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EXAMINER:	DATE CONSIDERED:

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP §609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.